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ABSTRACT

The purpose of this study was to determine if the patterning of the responses of English as a Second Language (ESL) students to a reading comprehension test would change over time due to the restructuring of the subjects ESL reading comprehension competence as they increased their overall ESL proficiency. In this context, restructuring refers to the reorganization of existing knowledge, the reallocation of processing resources, or the transformation of one kind of knowledge structure into another. A 30-item reading comprehension test was administered to the same subject pool of 31 intensive ESL students at three different strata of proficiency. The responses were submitted to principal component analysis, which identified the single best summary of linear relationships in each data set. The results indicate that the linear relationships manifested in the responses from the first administration did not change significantly during the two subsequent test administrations. It may be the case that no evidence of change was seen in the linear relationships in the responses because the subjects had not reached a point in their ESL reading comprehension competence sufficient to produce a patterning change. Another possible explanation is the use of a recognition format reading comprehension test to explore change. (Contains 2 tables and 26 references.) (Author/SLD)

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Changes in the Responses to an English as a Second Language Reading Comprehension Test

Kyle Perkins and John T. Pohlmann

Summary

The purpose of the study was to determine if the patterning of ESL students' responses to a reading comprehension test would change over time due to the restructuring of the subjects' ESL reading comprehension competence as they increased their overall ESL proficiency. In this context, restructuring refers to the reorganization of existing knowledge, the reallocation of processing resources, or the transformation of one kind of knowledge structure into another. A 30-item reading comprehension test was administered to the same subject pool of intensive ESL students at three different strata of proficiency. The responses were submitted to principal component analysis which identified the single best summary of linear relationships in each data set. The results indicated that the linear relationships manifested in the responses from the first administration did not change significantly during the two subsequent test administrations. It may be the case that no evidence of change was seen in the linear relationships in the responses because the subjects had not reached a threshold in their ESL reading comprehension competence at which point their comprehension capacity had increased enough to produce a significant change in their pattern of responses to the test items. Another possible reason to account for the absence of change in the linear relationships of the responses is the use of a recognition format reading comprehension test as the elicitation instrument.

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1 Introduction

This paper reports a study whose purpose was to determine whether ESL readers' responses to a reading comprehension test would change over time (as measured by a factor analysis of the examinees' responses) due to restructuring as a result of the readers' increasing language proficiency. We expect that as ESL readers become more proficient in English, their working memory "in and for English" increases. Because working memory plays a significant role in the processing and in the storage of the intermediate and the final products of the reading comprehension process, we expect more advanced readers to be able to reallocate processing resources that once were focused on processing lower-level textually explicit questions in the early stages of their ESL proficiency, for example, to processing higher-level textually implicit questions. The reallocation of processing resources is an example of restructuring of the reading comprehension competence and process in the context of this research. We expect change in the linear relationships in the student response patterns to change, not the reading comprehension test itself.

The first section of the paper will contrast restructuring with other well-known modes of learning such as accretion, increases in processing speed, modular learning, transformation, and vector learning (cf. Young & Perkins, 1995), and will show how restructuring provides the theoretical underpinnings and the rationale for the study.

1.1 Accretion

In its most simplistic form, accretion refers to the growth or increase of new information, one entry at a time. Several second language acquisition studies have focused on the linear, monotonic accumulation of formulaic expressions and of vocabulary items; for example, Broeder,

Extra, and van Hout (1989) examined the accretion of spoken Dutch vocabulary in the interlanguage of native Arabic and Turkish native speakers. The subjects' vocabulary stocks showed an increase during the three-month cycle of data collection.

1.2 Increases in Processing Speed

A second language learner's increase in the processing speed of language comprehension and language production involves a monotonic increase in a cognitive variable (processing speed) and is similar to accretion with one caveat - processing speed. Young and Perkins (1995) contend that processing speed is a procedural skill, clearly distinct from vocabulary accretion which involves declarative knowledge. An example of research in this genre includes Conrad's (1989) study of the recall of English sentences by subjects at three different points on an ESL proficiency continuum. Conrad found that her subjects' retention increased concurrently with an increase in their proficiency in the second language. An increase in the short-term memory store in the target language was cited as the probable explanation of the results.

1.3 Modular Learning

Fodor (1983) advanced a model having separate mental faculties or structures. Implications of modular learning in second language acquisition entail the independent development of knowledge structures and the lack of interaction of knowledge structures, one with another, until some very late stage of development, if at all. Meisel, Clahsen, and Pienemann (1981) and Meisel (1983) reported a modular account of the acquisition of word order in German as the target language in which the acquisition followed a fixed sequence during which target language rules gradually replaced innate processing strategies.

1.4 Transformation

Young and Perkins defined transformation as the routinization of declarative knowledge structures through practice. Declarative knowledge structures are thought to be conscious and accessed slowly, while procedural knowledge structures, on the other hand, are largely unconscious in nature and are accessed with alacrity. Bialystok (1978) brought the second language acquisition research community's attention to the distinction between automatic and controlled knowledge structures, and Young (1989) has tentatively suggested that sociolinguistic competence may only be possible after the learner has routinized control of the relevant variable linguistic forms.

1.5 Vector Learning

Young (1991) defined vector learning as the gradual accumulation of more knowledge and more skill with a concomitant increase in the speed of comprehension and of production. The behavior and knowledge changes are unidirectional - from less to more - and, hence, there are no logical possibilities of back-sliding or of U-shaped behavior.

1.6 Restructuring

As Young and Perkins noted, restructuring is the reorganization of existing knowledge or the transformation of one kind of knowledge structure into another. During restructuring, each newly-acquired datum is interpreted vis-a-vis how the learner's knowledge structures are organized at that point in time.

1.7 How Restructuring Changes

McLaughlin (1990) used attributes such as "routinized" and "qualitative change" to characterize restructuring. And here is how restructuring is thought to take place. The sub-skills

which are necessary to complete the task become automatic as the result of practice. Routinization becomes possible through the initial use of controlled processes which require conscious attention and which consume time. Controlled processes are freed up to being reallocated to other levels of processing, as the sub-skills become routinized. McLaughlin also noted that restructuring can also be coterminous with discontinuous or qualitative changes, with each novel change constituting a new internal organization of knowledge structures and not merely the accretion of new structural elements. Development, then, can be thought of as occurring in stages, and changes can be discontinuous (cf. Perkins, Brutten, & Gass, 1996). It follows then that modularity can be engaged to describe restructuring. One could assume, for example, that it is entirely possible that development in one domain such as orthographic processing could advance differentially from development in another domain such as determining the main idea of a text.

The purpose of the preceding section was to situate restructuring in the broader field of second language acquisition and to establish its importance. We can infer from this brief introduction that learning can manifest itself in myriad ways, and restructuring is a very common theme in many accounts of second language learning, because we find constant reference to the complex interaction among and between different kinds of knowledge structures in second language development. In addition, there are various references to the importance of explaining how the acquisition of a new knowledge structure interacts with existing knowledge structures to bring about reorganization/restructuring.

A recurring theme in all the restructuring accounts is reference to resources, capabilities, and the reallocation of processing resources which lead to restructuring. McLaughlin stated that

"from an information-processing perspective, the mechanisms of change involved in restructuring results from the [learner's] *developing capacities*" (italics added) (p. 120). Mislevy (1993) defined a learner's knowledge as "a complex constellation of facts and concepts, and the networks that interconnect them, of automatized procedures and conscious heuristics....; of perspectives and strategies, and the *management capabilities by which the learner focuses his efforts*" (italics added) (p. 28).

1.8 Capacity Constrained Comprehension

Thus far, we have tried to establish the importance of restructuring in second language acquisition research and to suggest that restructuring is related to a learner's capacities and reallocation of processing resources. These discussions segue to a theory, capacity constrained comprehension, which, we contend, can help to explain how an ESL reader's underlying reading comprehension competence can be restructured.

Just and Carpenter's (1992) theory is based on the following rationale.

> Working memory plays a critical role in storing the immediate and final products of a reader's or listener's computations as she or he constructs and integrates ideas from the stream of successive words in a text or spoken discourse. Working memory is a pool of operational resources that perform the symbolic computations and thereby generate the intermediate and final products. Cognitive capacity constrains comprehension (p. 122).

Capacity constrains comprehension as follows, according to Just and Carpenter. There is a finite amount of activation available to support both processing and storage. Each word, phrase, clause, and meaning unit has an activation level associated with it. If an element's activation level is above the established threshold, it becomes part of working memory. If an element's activation level is below the established threshold for comprehension or integration into working memory, a

portion of the activation supporting "old" elements in working memory will be internally reallocated, and these elements from which activation has been removed will be forgotten. "When the task demands exceed the available resources, both storage and comprehension functions are degraded. We call this theory capacity constrained comprehension" (Just & Carpenter, 1992, p. 124).

A central tenet of Just and Carpenter's research is that language comprehension depends on the language user's working memory capacity. For second language reading research, several important implications follow:

1. Readers having adequate working memory capacities can simultaneously store meaning units from prior sentences while processing incoming propositions.
2. Reading comprehension tasks requiring a voluminous amount of inputs are more likely to tax comprehension and storage than those tasks requiring fewer, simpler inputs.
3. If the resources demands of a reading comprehension task exceed the available resources, the task will fail and/or activation maintaining old elements will be deallocated, leading to displacement or forgetting.
4. Increases in overall language proficiency, instruction, and practice are likely to lead to greater efficiency in reading comprehension.

Just, Carpenter, Keller, Eddy, and Thulborn (1996) validated the hypothesis presented in Just and Carpenter as follows. The researchers had subjects process visually-presented sentences that varied in linguistic complexity. The results indicated that the neural activity and the engagement of Broca's and Wernicke's areas and their right-hemisphere homologs increased as

the computational demand of the comprehension task and the syntactic complexity of the stimulus sentences increased.

Barasalou (1992) advanced a hypothesis similar to Just and Carpenter's theory of capacity constrained comprehension:

> Once automatic productions develop for an activity, executive productions become free to do other things. In reading, executive productions, freed from accessing word meanings, can integrate major points in the text and access their validity (p. 89).

We believe that Just and Carpenter's capacity constrained comprehension theory merits serious consideration in the second language research community because of its potential to explain restructuring, and because there is a rich tradition of second language acquisition studies related to the reciprocal nature of increased language proficiency and increased target language processing to which we now turn our attention.

1.9 Linguistic Threshold and Linguistic Interdependence Hypotheses

The relationship between second language reading as a language problem and second language reading as a reading problem has been under investigation for nearly two decades. Alderson (1984) sought to determine whether first language reading or second language would account for the most variance in second language reading performance. Cummins (1979, 1991) distinguished between academic and cognitive language proficiency. Cummins' research addressed a continuum of language proficiency on which second language learners require more time to acquire a target language for academic purposes and less time to acquire a target language for basic communicative purposes. Clarke (1979) coined the phrase "short circuit hypothesis" to suggest that second language learners must reach a criterion or threshold level of second language

proficiency before they can read a second language with facility. Cziko (1980), like Clarke, studied good and poor readers in their first language and examined their second language reading behavior.

Bernhardt and Kamil (1995) continued this genre of research by investigating what they called the Linguistic Threshold Hypothesis and the Linguistic Interdependence Hypothesis. In their formulation of the Linguistic Threshold Hypothesis, Bernhardt and Kamil state that one must know the target language in order to read it. Cummins' research on bilingual elementary school children indicated that reading comprehension knowledge, skills and abilities once acquired seem to transfer across languages. These findings lead Bernhardt and Kamil to hypothesize that reading and writing are transferable and will be available in the target language, once language operations have been acquired. The Linguistic Interdependence Hypothesis is stated as follows: "Reading performance in a second language is largely shared with reading ability in a first language" (p. 17).

Bernhardt and Kamil administered a reading comprehension test in both Spanish and in English to students in three levels of Spanish instruction, as well as the Nelson-Denny Reading Test. The researchers' intent was to examine the Linguistic Threshold Hypothesis and the Linguistic Interdependence Hypothesis and to answer the following questions:

> "1. What is the contribution of reading performance in English (L1) to performance on a basic reading test in Spanish (L2)?
> 2. Do L1 reading skills contribute differentially to L2 reading performance depending upon amount of exposure to the second language?" (p. 22).

The researchers found support for both hypotheses, noting that "a general conclusion is that reading variables account for between 10 and 16 per cent in second language reading; language proficiency accounts for 30 to 38 percent. In other words, while language proficiency accounts

for a greater proportion of the variance, first language reading also makes a significant contribution" (p. 25).

2 Rationale for the Current Study

Thus far in the paper, we have discussed three topics - restructuring, a theory of capacity constrained comprehension, and the Linguistic Interdependence and Linguistic Threshold Hypothesis. We have tried to present a convincing case that restructuring is a broad spectrum phenomenon in second language acquisition and is present when a newly-acquired knowledge, skill, or ability interacts with its existing counterpart and causes one of two things to happen: the reorganization of one type of knowledge, or the transformation of one type of knowledge into another. We have also argued that a theory from cognitive psychology - capacity constrained comprehension - has the potential to explain restructuring in ESL reading comprehension, especially in cases in which increases in overall language proficiency are likely to lead to greater efficiency in ESL reading comprehension.

The basic tenet of the capacity constrained comprehension theory is that persons can only achieve a finite number of tasks at a given time. The extent to which goals are accomplished depends on the amount of resources that the task requires and the amount of resource that is available for utilization. A low availability of the resource limits the task performance in the following manner. Tasks differ in the amount of resource required for completion. If enough of the resource is available to perform the task, performance may be good, but it is not guaranteed. A person's performance may also depend on the quality of available data and on the person's ability to simultaneously attend to different systems and data sources. If there is not enough resource available to accomplish the task, then performance may be poor. If the primary task at

hand does not require all of the resource, then an excess becomes available for secondary or tertiary tasks to utilize. In sum, if either the amount of resource necessary for a task's completion is not available, or if the quality of the data for a task is poor, then performance is virtually guaranteed to deteriorate (cf. Barasalou).

Bernhardt and Kamil's findings play a substantial role in the research reported in this paper because of their Linguistic Threshold Hypothesis. It is highly suggestive that a ESL reader's second language proficiency could play a significant role in restructuring ESL reading proficiency, because second language readers may first need to pass a language threshold in order for them to comprehend a text and to assign meaning to it with facility. As ESL readers' target language proficiency increases, their responses to reading comprehension questions may change, that is, their ESL reading comprehension competence may become restructured.

Our research is based on the following assumptions: the sub-skills associated with lower-level reading comprehension tasks such as finding or recalling the verbatim answer in a text to a textually explicit question becomes more automatic/routinized with increasing proficiency in the target language; there is a finite amount of resources available for all processing tasks; reading comprehension tasks differ in the amount of resources required for completion; and as sub-skills become routinized, processing resources can be freed up to be reallocated to other levels of processing, such as the processing of textually implicit questions. We assume that as ESL proficiency increases, there will be concomitant shifts in processing, and these shifts will be reflected in the linear relationships manifested in the responses to the reading comprehension items.

To illustrate how reading comprehension tasks differ in the amount of resources required for completion, we consider the following two hypothetical reading comprehension questions:

1. In what city was Christopher Columbus born?
2. Why was the professor so cynical when he answered the student?

To answer the first question, the reader must determine that (1) the relevance test for answering the question is to select the city where Christopher Columbus was born; and (2) the reader must search for or retrieve a match between the question stem and the verbatim answer in the text.

To answer the question, "Why was the professor so cynical when he answered the student?", a reader must use approximately the following strategy: (1) store the relevance test: the professor, cynical, why?; (2) search the long term memory for retrieval cues; (3) determine that a conclusion or an inference must be drawn from the stated facts in the test; (4) search the long term memory for the stated facts from which an inference must be drawn; (5) determine those instances which indicate that the professor was cynical; (6) draw the inference and (7) produce a response/answer to the question.

Textually implicit inference questions required many processing and storage assets for the following reasons. Inferring involves (1) reading between the lines -- making more lines of text; (2) going beyond the information given and using existing knowledge to generate meaning; and (3) going beyond the verbatim memory for the words of a sentence dealing with the form and the structure of what we know, creating abstract conceptual forms.

Second language readers have a restricted memory span in English because of their developing competence -- too few resources for storage and comprehension functions in the Just

and Carpenter framework -- to be able to process and recall large quantities of text. As a result, a substantial amount of sensory information may be lost from the sensory stores during the reading comprehension process due to decay and possibly due to native-language interference. If readers do not have sufficient resources for comprehension, processing, and storage functions, a considerable amount of information may be lost from the sensory stores, and the requisite conscious mental processes associated with proficient reading comprehension become short circuited, and textual information in the working memory cannot be encoded and stored for later transfer to the long term memory where the relevant episodes could be established in the episodic memory with appropriate node labels and the newly formed propositions become incorporated into a textual propositional network.

The purpose of this study was to administer a multiple-choice recognition format reading comprehension test to a cohort of intensive English students as they increased their overall ESL proficiency and to analyze their responses to the elicitation instrument to determine if there was any evidence of restructuring, that is, a change in the response pattern to the items at three different points in time.

2.1 Subjects

The reading comprehension test utilized in this research was administered to a cohort of beginning level, intensive English students at the conclusion of their first term of instruction. They had TOEFL scores of 397 and below. The same reading comprehension test was administered to this cohort at the conclusion of their next two levels of instruction. The examinees had TOEFL scores of 400-437 during the second term of instruction, and 440-467 during the third term.

There was subject pool attrition throughout the 24 weeks of the study, and complete data sets were available for only 31 subjects. Their native language distribution was as follows: Japanese, eight; Chinese, seven; Arabic, six; Korean, five; Spanish, four; and Indonesian, one.

2.2 Instrumentation

We utilized a secure, local, in-house, five-passage, 30-item, multiple-choice recognition format reading comprehension test to elicit responses. The subjects were not told anything about the passages in advance of data collection. The test was in English, and no attempt was made to assess comprehension in the subjects' preferred language. Recall was not employed because we did not want to introduce subjectivity into the scoring. The test contained direct questions cued on explicit information in the passages, and indirect questions which required the subjects to construct relationships across and between sections of the texts using the same or different vocabulary as that found in the text.

Passage one contained 125 words, had one indirect and two direct questions, and the topic was from the life sciences. The overall organization was a description. Passage two had 164 words, three direct and two indirect questions, a description rhetorical organization, and discussed a topic from the social sciences. Passage three presented a topic from the physical sciences in a contrast rhetorical organization, and contained 146 words with five direct and three indirect questions. Passage four, from the social sciences, contained 110 words with three direct and two indirect questions, and was organized as a comparison of two concepts. Passage five was the longest passage, 294 words in length, had five direct and four indirect questions, and was a collection of attributes about a topic from the humanities.

For concurrent-related evidence, we correlated the scores from the test used in this research with the TOEFL reading comprehension section, and the resulting Pearson product-moment correlation was 0.88. The internal consistency estimates for each administration are shown in the summary table.

3 Data Analysis

3.1 Factor Analysis

We chose factor analysis to determine whether any changes had occurred in the underlying structure of the subjects' responses to the reading comprehension test which was administered to the subjects at three different points on the ESL proficiency continuum. Normally, statistical inference in factor analysis is performed with parametric goodness-of-fit tests, and multivariate normality is assumed (Kendall, Stuart, & Ord, 1983; Loehlin, 1987). Parametric goodness-of-fit tests are based on asymptotic expressions which are most accurate in large samples. Our data sets were small, and we could not guarantee that our data manifested normality and homogeneity, which are two basic assumptions that data must meet if they are to be analyzed with parametric tests. For these reasons, we used non-parametric permutation tests on factor analyses of small, binary variable data sets.

3.2 Permutation Tests

Permutation, or randomization tests, are based on probability statements derived solely from observed data sets. They are robust, non-parametric tests, and no assumptions about theoretical sampling distributions are needed. While conducting the analyses for this research, we followed the methods proposed by Buja and Eyuboglu (1992) and Horn (1965). Buja and Eyuboglu examined permutation tests as a form of parallel analysis in principal component analysis. Horn

proposed parallel analysis as a factor analysis inference tool. Horn's parallel analysis was performed by comparing observed factor analysis results with those obtained on randomly simulated data sets. Computer simulated independent, normal deviates were generated to create a random data matrix of the same order as the observed data matrix. Eigenvalues from the observed and parallel data sets were compared to perform significance tests. Scree plots of the observed and random eigenvalues were constructed. If an observed eigenvalue was larger than the corresponding randomly generated eigenvalue, it was deemed significant. The Scree Test generates a plot of eigenvalues which is helpful in deciding how many components to retain for analysis. An eigenvalue indicates the amount of variance that the component accounts for.

Zwick and Velicer (1990) empirically compared many of the standard rules for determining the number of common factors in a correlation matrix. Parallel analysis, along with the Scree Test, goodness-of-fit tests, Kaiser's eigenvalue 1 rule, and residual correlation analysis were examined for their ability to accurately estimate the number of latent factors. Parallel analysis was found to be the most accurate method for determining the number of dimensions in data sets.

3.3 Psychometric Analysis

Each 31-subject by 30-item data set was submitted to a principal component analysis. Critical values of significance tests for eigenvalues and loadings were estimated from a distribution of eigenvalues and loadings computed on 1,000 permuted samples of the original data. Programs were written in FORTRAN and IML (SAS Institute, 1989) to generate and to analyze the permuted data sets. Loadings are correlations between the test item and the principal component.

A permuted sample was created by randomly and by independently permuting the column values of an observed data set. After each column was randomly shuffled, a principal component analysis was performed. Eigenvalues and loadings from 1,000 permuted samples were archived and used for significance testing. The 95th and 99th percentile eigenvalues and loadings from the permuted sample were used as critical values for the .05 and .01 alpha level tests.

The loadings on the first principal component from the permuted samples were used to estimate the .05 and .01 alpha level critical values. The permuted sample loadings were transformed to absolute values so that one-tailed tests could be performed on the loadings. Only positive loadings are meaningful in this research. A negative loading would indicate that subjects failing that item scored higher on the test. No significant negative loadings were observed. It was determined that the critical values of approximately .61 and .71 respectively were required for loadings to be significant at the .05 and .01 levels.

3.4 Review To This Juncture

The purpose of the preceding sections has been four-fold: first, to situate restructuring in the broader field of second language acquisition research and to establish its importance as a locus for further research; second, to relate restructuring to a learner's capacities and reallocation of processing resources; third, to contextualize the research reported in this paper to the Linguistic Threshold and the Linguistic Interdependence Hypotheses; and fourth, to motivate the reasons for using non-parametric permutation tests on factor analyses of small, binary variable data sets.

Based on previous research, we were lead to conclude that an increase in ESL readers' proficiency could cause the reorganization of one type of knowledge, or the transformation of one type of knowledge into another. The reliance on increased ESL proficiency to effect restructuring

is corroborated by Just and Carpenter's theory of capacity constrained comprehension. As our subjects' overall ESL proficiency increased, we inferred that they should have more working memory "in and for English" and therefore should be able to store more intermediate and final products of their computations as they construct and integrate ideas during the reading comprehension process. We reasoned that if the conditions stated in the previous sentence were indeed the case, we should be able to detect a change in the structure of their responses manifested in the results of the factor analyses. The work reported in this paper is also related to a strong tradition of research which has tried to determine whether second language learners must reach a threshold level of second language proficiency before they can read a second language with facility. For these reasons, we administered a multiple-choice, recognition format reading comprehension test to a cohort of intensive English students at three different (increasing) strata of overall ESL proficiency. The three sets of responses were submitted to principal component analysis to determine if there was evidence of a change in the response patterns to the items at three different points in time. Non-parametric permutation tests on factor analysis were utilized to perform statistical inference in this research to preclude an inappropriate, over-extensive analysis of the small, binary data sets which were elicited for the study.

4 Results

(Put Table 1 about here)

Table 1 presents the summary data and the inter-test correlations, which amount to an estimate of test-retest reliability. As Table 1 indicates, the mean scores increased with each administration of the test, and the Kuder-Richardson Formula 20 internal consistency estimates also improved.

The results of the principal component analysis indicated that the first eigenvalue increased in magnitude with each subsequent administration, and a stronger first factor indicates that more variance is being explained. The first eigenvalues from all three test administrations were significant at the .01 level. The second eigenvalue from the first administration was significant at the .05 level, but not at the .01 level. The second factor from the first administration proved not to be significant when a Bonferroni correction for multiple tests was used. We conclude, therefore, that the dimensionality of the test did not change as the subjects' overall ESL proficiency increased (as estimated by the TOEFL).

(Put Table 2 about here)

Table 2 presents the significant first component loadings from the three testing occasions. For a factor loading to be considered significant, it had to be .61 at the .05 level and .71 at the .01 level. Only the significant loadings are shown in Table 2.

Inspection of the loadings shown in Table 2 revealed that the significant loadings were observed among the later items in the test which were associated with the longest reading passage. Items associated with the longest reading passage were the most salient items, and this phenomenon occurred on all three testing occasions. We conclude that the questions linked to the longest reading passage were more discriminatory on the general factor.

5 Discussion

We did not detect any evidence of restructuring or changes in the response patterns to the reading comprehension items at three different points in time, as our subjects' proficiency in overall ESL proficiency increased. The tests of dimensionality employed in the research indicated

a strong single factor. In other words, the dimensionality of the test did not change during the ESL program.

There is a number of issues to be considered. First, we may have been dealing with a too-narrowly constrained proficiency continuum for restructuring to occur. It may well be the case that ESL students must advance beyond a TOEFL score of 467 for restructuring in reading comprehension to occur. In other words, a TOEFL score of 467 may not be a high enough "threshold" to reach in order for restructuring to occur in ESL reading comprehension, if it occurs at all. Our future research activities in this area will include students whose TOEFL scores extend to the 500 and 600 bands.

6 Future Research

Our future research on restructuring will utilize a different format than the recognition format employed in the present research. It may be the case that a multiple-choice recognition format assesses recognition processes rather than production processes. In the future, we will utilize protocols that most assuredly engage interaction between the reader and the text and interaction between higher- and lower-level processes, i.e., top-down and interactive processing. Our future protocols will ensure that readers will utilize topical background knowledge, text structure, and general semantic knowledge to make predictions. Potential candidates under consideration include story maps and rating scales for the revaluation of retelling/recalling; miscue analysis; the cloze procedure; literature responses; and think-aloud exercises that focus on the active construction of meaning.

And finally, we would be remiss if we did not mention the practice effect. As Table 1 indicates, the mean scores increased from one administration to the next. It is the case that

increases in the mean scores could have been obtained without any increases in ESL proficiency due to the practice effect; however, gain scores and an analysis of variance of the differences in mean scores were not of concern to us in this study. Our research focused on whether there was any evidence of restructuring in the underlying structure of the responses to a reading comprehension test. We did not find what we were looking for, but we remain convinced that restructuring must surely be related to the allocation and reallocation of processing resources. We continue to seek the threshold level of proficiency at which this restructuring takes place and further seek to identify the elicitation instruments with which to gather the data which would allow restructuring to manifest itself, if such a phenomenon exists in ESL reading comprehension.

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Table 1
Summary Data

	First Administration	Second Administration	Third Administration
Mean	13.84	15.90	17.61
SD	4.09	4.72	5.18
Min	7	8	9
Max	22	26	20
KR-20	.628	.732	.789
SEM	2.49	2.44	2.38

Correlations Between Administrations

r12 = .5936
r13 = .5567
r23 = .7427

Table 2
Factor Loadings

Item	First Administration	Second Administration	Third Administration
24		.75**	
25	.62*		
26			.80**
28	.65*	.64*	.70*
29	.78**		.69*
30			.71**

* $p < .05$

** $p < .01$

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